

## A review of the *Gnathonarium* species (Araneae: Linyphiidae) of China

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### **A review of the *Gnathonarium* species (Araneae: Linyphiidae) of China.**

- The present paper gives a review of the *Gnathonarium* species known from China. A total of four species are recorded, including one new species *G. biconcavum* sp. n., *G. cornigerum* Zhu & Wen, 1980, *G. phragmigerum* Gao & Zhu, 1988 and *G. flavidum* Gao & Zhu, 1993 are synonymized with *G. cambridgei* Schenkel, 1963. A description of the new species and redescriptions of the known species are given.

**Keywords:** Taxonomy - Linyphiidae - *Gnathonarium* - new species - China.

### INTRODUCTION

The monotypic linyphiid spider genus *Gnathonarium* was established by Karsch (1881) for *Gnathonarium rohlfsianum* Karsch, 1881, which was later regarded as a junior synonym of *Theridion dentatum* Wider, 1834. According to the catalogue of Platnick (2004), the genus currently comprises eight species, and seven of them have been reported from China. After having checked the paratype material of *Gnathonarium cornigerum* Zhu & Wen, 1980, *G. phragmigerum* Gao & Zhu, 1988, *G. flavidum* Gao & Zhu, 1993 and holotype of *G. cambridgei* Schenkel, 1963, we have come to the conclusion that they are conspecific. Furthermore, the distributional records of *G. exsiccatum* (Bösenberg & Strand, 1906) in China (Gao & Zhu, 1990; Song, Zhu & Chen, 1999) are doubtful, and should be deleted from the Chinese spider list. Therefore, only three species reported before really occur in China: these are *G. cambridgei* Schenkel, 1963, *G. dentatum* (Wider, 1834), and *G. gibberum* Oi, 1960.

In the present paper, a forth *Gnathonarium* species from China, *G. biconcavum* sp. n., is reported. Descriptions and diagnoses of the new species and of the other known species occurring in China, as well as a key to all these species are given. Further information on distribution and illustrations of somatic and genital characters of all species are provided.

### MATERIAL AND METHODS

Specimens were examined and measured under a SZ11-Olympus stereomicroscope. Left palps of males and epigyna of females were illustrated after they were dissected from the spider body; vulvae were cleared in boiling NaOH solution. For

examination of the genital structures under a transmission light microscope, genital organs were immersed in 75% alcohol, embolic divisions and vulvae were mounted in Hoyer's Solution. All illustrations were made under an Olympus BX40 compound microscope by using a drawing tube.

The material examined is deposited in the Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS), in the Jilin University, Changchun, China (JLU), in the Burke Museum, Seattle, USA (UWBM), in the Museum National d'Histoire Naturelle, Paris, France (MNHN), in the Naturhistorisches Museum Basel, Switzerland (NMB) and in the Muséum d'histoire naturelle, Genève, Switzerland (MHNG).

For each species, only references to original description and references to relevant papers by Chinese colleagues are given in the text. Other references listed in Platnick's spider catalogue (Platnick, 2004) are not provided. Updated information on the distribution of each species in China is presented at the provincial level (see Peng, Li & Rollard, 2003).

Leg measurements are given in the following sequence: Total (femur, patella + tibia, metatarsus, tarsus). All measurements are in millimeters. All scale lines are 0.1 mm in length. Terminology for somatic morphology and genital structures is after Hormiga (2002) and Saaristo & Koponen (1998). Abbreviations are used as followed:

Somatic morphology: AER- anterior eye row; ALE- anterior lateral eye; AME- anterior median eye; AME-ALE- distance between AME and ALE; AME-AME- distance between AMEs; AMEd- diameter of AME; CL- carapace length; CW- carapace width; OL- opisthosomal length; OW- opisthosomal width; PER- posterior eye row; PLE- posterior lateral eye; PME- posterior median eye; PMEd- diameter of PME; PME-PLE- distance between PME and PLE; PME-PME- distance between PMEs; TL- total length; Tm I- distance of trichobothrium from metatarsus base of leg I (as a fraction of metatarsus length); Tm IV – trichobothrium on metatarsus IV.

Male palp: ATC- anteroventral tegular cornu; DSA- distal suprategular apophysis; E- embolus; EM- embolic membrane; MT- mesal tooth of tibial apophysis; P- paracymbium; PT- protégulum; R- radix; SPT- suprategulum; T- tegulum.

Epigynum: CD- copulatory duct; CO- copulatory opening; DE- ventral depression; EI- epigynal index [expressed as a/b, a is the width of ventral plate between copulatory openings and b is the width of copulatory opening]; FD- fertilization duct; FO- fertilization opening; PMP- posterior median plate [= VP + DE]; PR- posterior cone-shaped recess of PMP; SRS- spherical part of seminal receptacula; VP- ventral plate.

## TAXONOMY

### *Gnathonarium* Karsch, 1881

*Gnathonarium* Karsch, 1881: 10. Type species by monotypy *Gnathonarium rohlfsianum* Karsch, 1881 [= *G. dentatum* (Wider, 1834), originally placed in *Theridion*].

*Diagnosis.* The genus is characterized by the following set of characters in the male palp (Figs 1-4C-E): paracymbium shaped like a number "3" (Fig. 4C), although usually only the distal half of the paracymbium is visible in retrolateral view (Figs 1-3C); distal suprategular apophysis large, somewhat resembling a straw hat in lateral

view; radix exceptionally small, bearing a long, whip-like embolus and a long, narrow embolic membrane. Female epigynum vase-like in general appearance, posterior median plate with deep posterior recess (PR) covered by ventral plate (Figs 1H, 2-4F).

*Description.* Tm I 0.59- 0.66. Tm IV present. Tibial spines 2-2-1-1. Carapace protruding slightly over clypeus, in males with some modifications (Figs 1A, 4A) or without (Figs 2A, 3A). Chelicerae of both sexes with warty granulations anterolaterally, with 4-6 promarginal and 2-4 retromarginal teeth, males also with a tooth-like subapical frontal process bearing a fine hair at its tip (Figs 1G, 2-4B).

Male palp (Figs 1-4C): Patella with small ventral process at distal end. Tibia (Fig. 1F) with one prolateral and two retrolateral trichobothria, tibial dorsal apophysis long, distally hooked, with a tooth on its mesal margin (MT). Paracymbium in the shape of a "3" (Fig. 4C), carrying several long hairs, usually only the distal half visible in retrolateral view (Figs 1-3C). Protegulum fleshy, boat-shaped, but sometimes contracted and somewhat metamorphosed (Figs 2C, 4C). Distal suprategular apophysis (DSA) large, somewhat like a straw hat in lateral view. Structures of embolic division simple and with little interspecific variation: radical part (R) conspicuously small, but embolus (E) long, whip-like and strongly sclerotized, embolic membrane (EM) long and narrow (Figs 1-4E).

Epigynum and vulva (Figs 1H-I, 4F-G): Epigynum vase-like due to combined effect of transparent copulatory ducts (CD) and posterior median plate (PMP). The latter with a median recess (PR) and entirely or partly covered by ventral plate (VP), copulatory openings (CO) on both sides with shallow roundish depressions (DE). Copulatory ducts conspicuously wide, first converging towards each other, then running parallel, touching each other at median line, and finally turning more or less abruptly laterally. Seminal receptacula situated laterally of parallel parts of copulatory ducts.

#### KEY TO CHINESE *GNATHONARIUM* SPECIES

- 1 Male . . . . . 2
- Female . . . . . 5
- 2 Carapace with lobe-like elevation behind ocular area (Fig. 4A) . . . . . *gibberum*
- Carapace only slightly elevated behind ocular area . . . . . 3
- 3 Carapace with a pair of oval sulci behind ocular area in dorsal view (Fig. 1B) . . . . . *biconcavum* sp. n.
- Carapace without sulci behind ocular area (Figs 2A, 3A) . . . . . 4
- 4 The dorsal lobe of DSA large and with a somewhat flat-roof (Fig. 3C) . . . . . *dentatum*
- The dorsal lobe of DSA only moderately elevated and with a point-top (Fig. 2C) . . . . . *cambridgei*
- 5 Ventral plate entirely covering PR, posterior margin of PMP almost straight (Fig. 2F) . . . . . *cambridgei*
- Ventral plate partly covering PR, posterior margin of PMP deeply notched . . 6
- 6 Copulatory ducts long, about one and half circle, apical part point (Fig. 4F) . . . . . *gibberum*

- Copulatory ducts shorter, about one circle, apical part blunt and only slightly rolling . . . . . 7
- 7 Copulatory openings large and EI= 1.2 (Fig. 1G) . . . . . *biconcavum* sp. n.
- Copulatory openings small and EI= 5.5 (Fig. 3F) . . . . . *dentatum*

1. *Gnathonarium biconcavum* sp. n.

Fig. 1

Holotype: ♂ (IZCAS-Tu0041), shore of Ulungur Lake, Fuhai (also called Burultokay) District (47.1°N, 87.5°E), Xinjiang Uygur Autonomous Region, alt. 510 m, 11.VII.1991. The specimen was found under mats of grass covering the lakeshore. Paratypes: 2♂5♀ (IZCAS), same data as for holotype; 1♀ (IZCAS), Narat District (43.3°N, 84.0°E), Xinjiang Uygur Autonomous Region, 30.VII.1991.

*Diagnosis.* The male of *G. biconcavum* sp. n. is distinguished easily from all other *Gnathonarium* species by carapace having a pair of oval sulci and long, frontally curved hairs behind ocular area (Figs 1A-B). The female can be distinguished by the posterior median plate with large copulatory openings and an exposed posterior recess (Fig. 1H).

*Description of male.* TL 2.55, CL 1.25, CW 0.90, OL 1.50, OW 0.85. Carapace reddish brown. Rows of long hairs lying on the anteromedian part of the carapace, and bending downwards frontally. Behind ocular area, a pair of oval sulci on each side, with several circular pits in them and each pit bearing a short white hair. Eyes with black surroundings, AME smallest and ALE biggest, others subequal. AER recurved, PER straight, ALE and PLE close together; AME-AME equal to AME-ALE, less than AMEd; PME-PME slight longer than PMEd and PME-PLE shorter. Chelicerae brown, anterolaterally furnished with small warty granulations and with a tooth-like frontal process (Fig. 1G); promargin with four and retromargin with two teeth, first retromarginal one bifurcated. Legs pale brown; length of legs: I 3.42 (0.95, 1.12, 0.80, 0.55), II 3.44 (0.90, 1.02, 1.00, 0.52), III 2.75 (0.80, 0.85, 0.65, 0.45), IV 3.75 (1.00, 1.25, 0.95, 0.55). Tibial spines: 2-2-1-1; Tm I: 0.63; Tm IV present. Sternum brown. Abdomen grey.

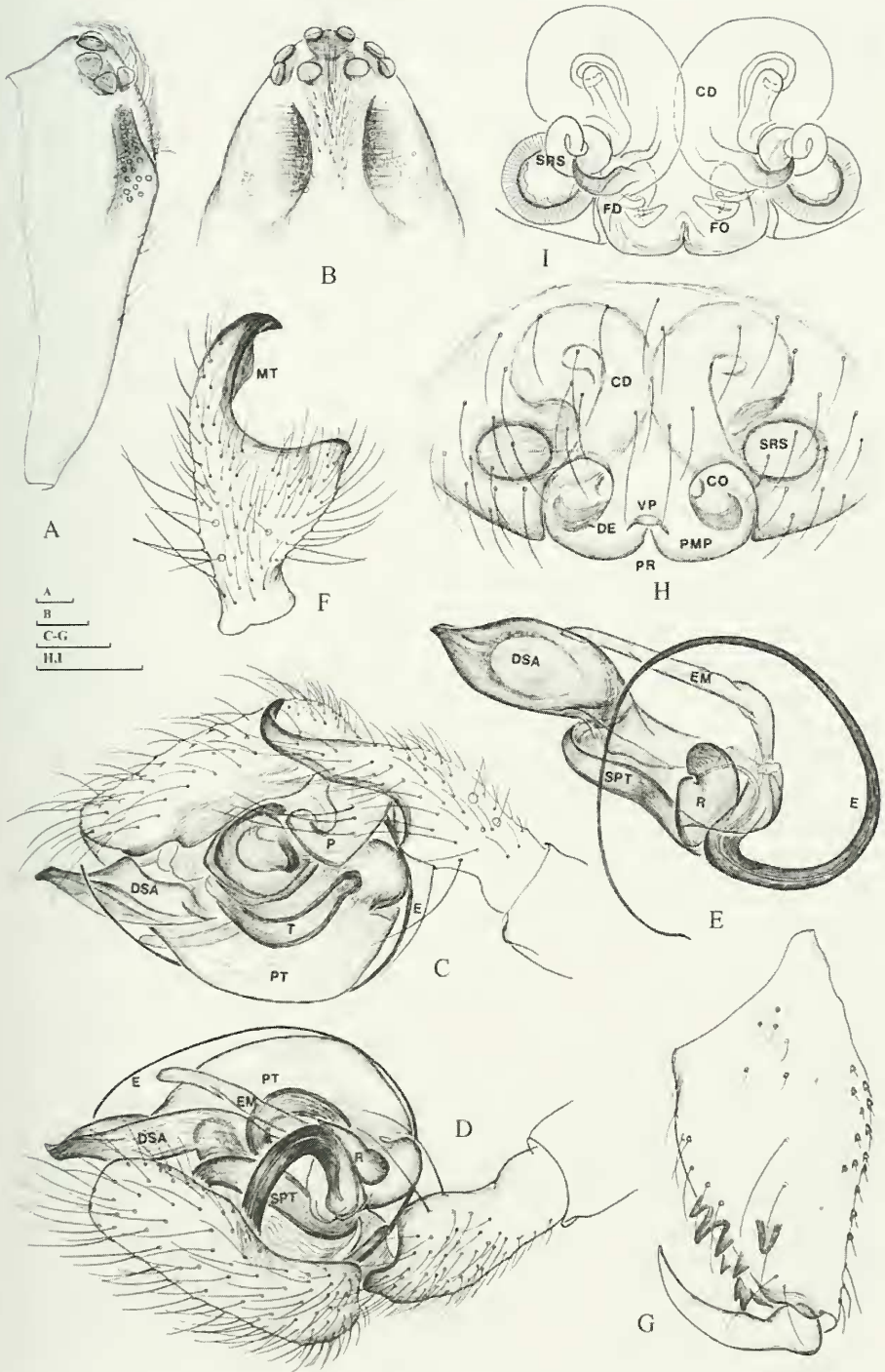
Palp: Distal process of patella very small. Mesal tooth (MT) of tibial dorsal apophysis wider than in other species (Fig. 1F). Distal suprategular apophysis (DSA) strongly sclerotized, especially at apical tip, the dorsal lobe small and cone-shaped in retrolateral view (Fig. 1C).

*Description of female.* Carapace without conspicuous modification, and chelicerae without tooth-like frontal process. Besides these, somatic characters of the female are same as in the male.

Epigynum: Vase-like, cuticle of seminal receptacula and a pair of coiled copulatory ducts clearly visible through the body wall. Posterior median plate (PMP) with large copulatory openings (CO) and large depressions (DE), EI= 1.2. Ventral plate short, most part of posterior recess (PR) exposed.

FIG. 1

*Gnathonarium biconcavum* sp. n. A, carapace of male, lateral view; B, carapace of male, dorsal view; C, left male palp, retrolateral view; D, left male palp, prolateral view; E, embolus division, ventral view; F, palpal tibia, dorsal view; G, left chelicera of male, anterior view; H, epigynum, ventral view; I, vulva, dorsal view. [Scale lines: 0.1 mm].



*Etymology.* The Latin adjective “biconcavus, -a, -um”, meaning two hollows on sides, refers to the two sulci on the dorsal surface of the carapace of male.

*Distribution.* China (Xinjiang).

## 2. *Gnathonarium cambridgei* Schenkel, 1963

Fig. 2

*Gnathonarium cambridgei* Schenkel, 1963: 114, fig. 67 (♀).

*Gnathonarium cornigerum* Zhu & Wen, 1980: 19, figs 2A-F (♂ ♀); Hu, 1984: 193, figs 202.1-6 (♂ ♀); Zhu & Shi, 1985: 114, figs 100A-F (♂ ♀); Zhang, 1987: 126, figs 104.1-4 (♂ ♀); Song, Zhu & Chen, 1999: 169, figs 95N-O, 96J-K (♂ ♀); Hu, 2001: 543, figs 364.1-5 (♂ ♀); Song, Zhu & Chen, 2001: 128, figs 67A-F (♂ ♀). (**Syn. n.**)

*Gnathonarium phragmigerum* Gao & Zhu, 1988: 350, figs 1-7 (♂ ♀); Song, Zhu & Li, 1993: 860, figs 16A-E (♂ ♀); Song, Zhu & Chen, 1999: 170, figs 96H-I, 97B-C (♂ ♀). (**Syn. n.**)

*Gnathonarium flavidum* Gao & Zhu, 1993: 28, figs 7-13 (♂ ♀); Song, Zhu & Chen, 1999: 169, figs 96D-E, O-P (♂ ♀). (**Syn. n.**)

*Type material examined.* 1♀ (MNHNP AR12799, Potanin 56), type of *G. cambridgei* Schenkel, 1963, Donkyr City in Amdo (today's name not clear), Gansu Province, leg. Dr G. N. Potanin, 14-15.IV.1885; 2♂8♀ (JLU), paratypes of *G. cornigerum* Zhu & Wen, 1980, from a small place called Beijiuhsui, Mt. Laoshan, Qingdao City, Shandong Province, leg. C. D. Zhu, 20.VIII.1979; 3♂3♀ (JLU), paratypes of *G. flavidum* Gao & Zhu, 1993, between Yangri Town and Xinhua Town, Shennongjia Forest Region, Hubei Province, leg. J.C. Gao, 18.VIII.1986; 6♂2♀ (JLU), paratypes of *G. phragmigerum* Gao & Zhu, 1988, Yangri Town, Shennongjia Forest Region, Hubei Province, leg. J.C. Gao, 22.VII.1986.

*Additional material examined.* 1♂1♀ (UWBM), under outdoor deck, Brayton Drive, Anchorage 160' 9599, Alaska (61.134°N, 149.852°W), USA, leg. B. S. Blitz, 15.IV.1990; 2♀ (UWBM), under outdoor deck, Brayton Drive, Anchorage 160' 9599, Alaska (61.134°N, 149.852°W), USA, leg. B. S. Blitz, 15.IV.1990; 1♀ (UWBM), in house, Cook Inlet area, Anchorage 0-350', Alaska (61.15-25°N, 149.7-9°W), USA, leg. J. Strassenburgh, 14.VII.1989; 10♂25♀ (MHNG), the thermal spring, Mt. Songshan, Yanqing District, Beijing City, leg. L. H. Tu, 12.VII.2002; 1♂2♀ (IZCAS), Qiujiaba Village, Wen District, Gansu Province, alt. 2550 m, leg. J. H. Wang, 20.VI.1999; 1♂1♀ (IZCAS), Panqu District, Gansu Province, Shatan Forestry Centre, alt. 2350-2400 m, leg. J. Chen, 5.VII.1998; 2♂ (IZCAS), Kangding District, Sichuan Province, leg. X. J. Peng, 8.VIII.2001; 1♂1♀ (IZCAS), Yutong, Kangding District, Sichuan Province, alt. 1500 m, 18.VIII.1981; 1♂ (IZCAS), Guanding thermal spring, Kangding District, Sichuan Province, alt. 3700 m, 16.VIII.1981; 3♀ (IZCAS), Xiushan District, Sichuan Province, 10.VI.1987; 2♀ (IZCAS), Changdu District, Tibet Autonomous Region, leg. X. J. Peng, 15.VI-II.2001; 1♂1♀ (IZCAS), Riwoqê District, Tibet Autonomous Region, leg. X. J. Peng, 18.VI-II.2001; 1♀ (IZCAS), Maniganggo Town, Dêgê District, Tibet Autonomous Region, leg. X. J. Peng, 11.VIII.2001; 1♀ (IZCAS), Mt. Moirigkawagarbo, Dêqên District, Yunnan Province, 24.VII.1982; 1♀ (IZCAS), Mt. Liupanshan, Jingyuan District, Ningxia Hui Autonomous Region, leg. Y. Q. Tang, 4.VII.1988; 1♀ (IZCAS), Qiuqianjia, Mt. Liupanshan, Ningxia Hui Autonomous Region, leg. Y. Q. Tang, 6.VII.1988; 3♂3♀ (IZCAS), Beijing City, 1974-1976; 1♀ (IZCAS), Yuanmingyuan Park, Beijing City, 19.VII.2002; 1♀ (IZCAS), Hanshiqiao Natural Reservoir, Shunyi District, Beijing City, leg. L. H. Tu, 11.VII.2002; 1♂4♀ (IZCAS), Badaling Great Wall, Yanqing District, Beijing City, 3.VII.1974; 1♂5♀ (IZCAS), Badaohe Village, Yanqing District, Beijing City, leg. L. H. Tu, 7.VII.2002; 6♀ (IZCAS), Xiadelongwan Village, Yanqing District, Beijing City, leg. L. H. Tu, 18.VIII.2002; 1♂3♀ (IZCAS), Baoshansi Village, Yanqing District, Beijing City, leg. L. H. Tu, 19.VIII.2002; 30♂38♀ (IZCAS), the thermal spring, Mt. Songshan, Yanqing District, Beijing City, leg. L. H. Tu, 12.VII.2002; 4♀ (IZCAS), Songshan Forest Center, Mt. Songshan, Yanqing District, Beijing City, leg. L. H. Tu, 14.VII.2002; 65♂60♀ (IZCAS), Mt. Jingdongdaxiagu, Pinggu District, Beijing City, leg. S. Q. Li, 11.VII.2002; 2♀ (IZCAS), Chaoyang District, Liaoning Province, VII.1985; 1♂2♀ (IZCAS), Tianjun District, Qinghai Province, alt. 3450 m, leg. X. J. Peng, 17.IX.2001; 1♀ (IZCAS), Mt. Qingshashan, Pingan District, Qinghai Province, leg. M. Wu, 14.VI.1997; 1♀ (IZCAS),

Maixiu Forest Center, Tongren District, Qinghai Province, leg. M. Wu, 14.VI.1997; 2 ♀ (IZCAS), Beishan National Nature Forest Park, Qinghai Province, leg. M. Wu, 7.VI.1997; 8 ♂ 7 ♀ (IZCAS), Hunan Province, leg. J. C. Gao, V.1985; 6 ♂ 11 ♀ (IZCAS), Hunan Province, leg. J. C. Gao, V.1985; 1 ♀ (IZCAS), Mt. Changbaishan, Jilin Province, 26.VII.1987; 2 ♂ 3 ♀ (IZCAS), Mt. Longqishan, Jiangle District, Fujian Province, 16-20.VIII.1991; 5 ♀ (IZCAS), Kongcun Village, Yongnian District, Hebei Province, leg. S. Q. Li, 18.IX.1994.

*Diagnosis.* The carapace shape is similar to that of *G. dentatum*, without conspicuous modification, but the male is easily recognized by its slightly sclerotized distal suprategular apophysis (DSA) with a low conical lobe dorsally (Fig. 2C), and the female by its epigynum having posterior median plate with very large copulatory openings (CO) and depressions (DE), and with a straight posterior margin (Fig. 2F).

*Description.* TL 2.47-2.94. Carapaces of both sexes as illustrated in Fig. 2A, without conspicuous modification, ocular area slightly protruding over clypeus, some hairs lying behind ocular area. Chelicerae of both sexes with warty granulations anterolaterally; promargin with six teeth, retromargin with four; the first one on retromargin bifurcated; male also with a large frontal tooth-like process bearing a fine hair at the tip (Fig. 2B). Tm I 0.58- 0.61. Tm IV present. Measurements and a detailed description of the somatic morphology were provided by Zhu & Wen (1980) and Gao & Zhu (1988, 1993).

Male palp (Figs 2C-E): Distal process on patella seemingly bigger than in other species. Mesal tooth of tibial apophysis (MT) triangular, smaller than in the new species. Flethy prottegulum boat-shaped (in some specimens slightly contracted and metamorphosed). Anterior part of tegulum with a distinct anteroventral cornu (ATC). Distal suprategular apophysis (DSA) much more slender and less sclerotized, and most importantly, with smaller dorsal conical lobe than in other species.

Epigynum (Figs 2F-G): Posterior median plate (PMP) with the largest copulatory openings (CO) and depressions (DE) in currently known species of *Gnathonarium*. Ventral plate very large, posteriorly widening and entirely covering posterior recess (PR) of posterior median plate (PMP), acting as a septum between both copulatory openings; posterior margin of posterior median plate almost straight. Copulatory ducts longer than those in *G. biconcavum* sp. n., and apical part turning posteriorly.

*Distribution.* China (Beijing, Fujian, Gansu, Hebei, Hubei, Hunan, Jilin, Ningxia, Qinghai, Shandong, Sichuan, Tibet, Yunnan), USA (Alaska).

*Remarks.* A comparison of the holotype of *G. cambridgei* Schenkel, 1963 and paratypes of *G. cornigerum* Zhu & Wen, 1980, *G. phragmigerum* Gao & Zhu, 1988, *G. flavidum* Gao & Zhu, 1993 by us has revealed that they all are conspecific, and accordingly *G. cornigerum*, *G. phragmigerum*, and *G. flavidum* are herein regarded as junior synonyms of *G. cambridgei*. The distinctions observed by Gao & Zhu (1988, 1993) are due to intraspecific variation and different angles of view. Furthermore, Gao & Zhu (1988) emphasized that *G. cambridgei* should not be placed in the genus *Gnathonarium* because of the absence of a Tm IV. However, when checking the type of *G. cambridgei* we noticed that though the hair of Tm IV was missing, its socket was well discernible.

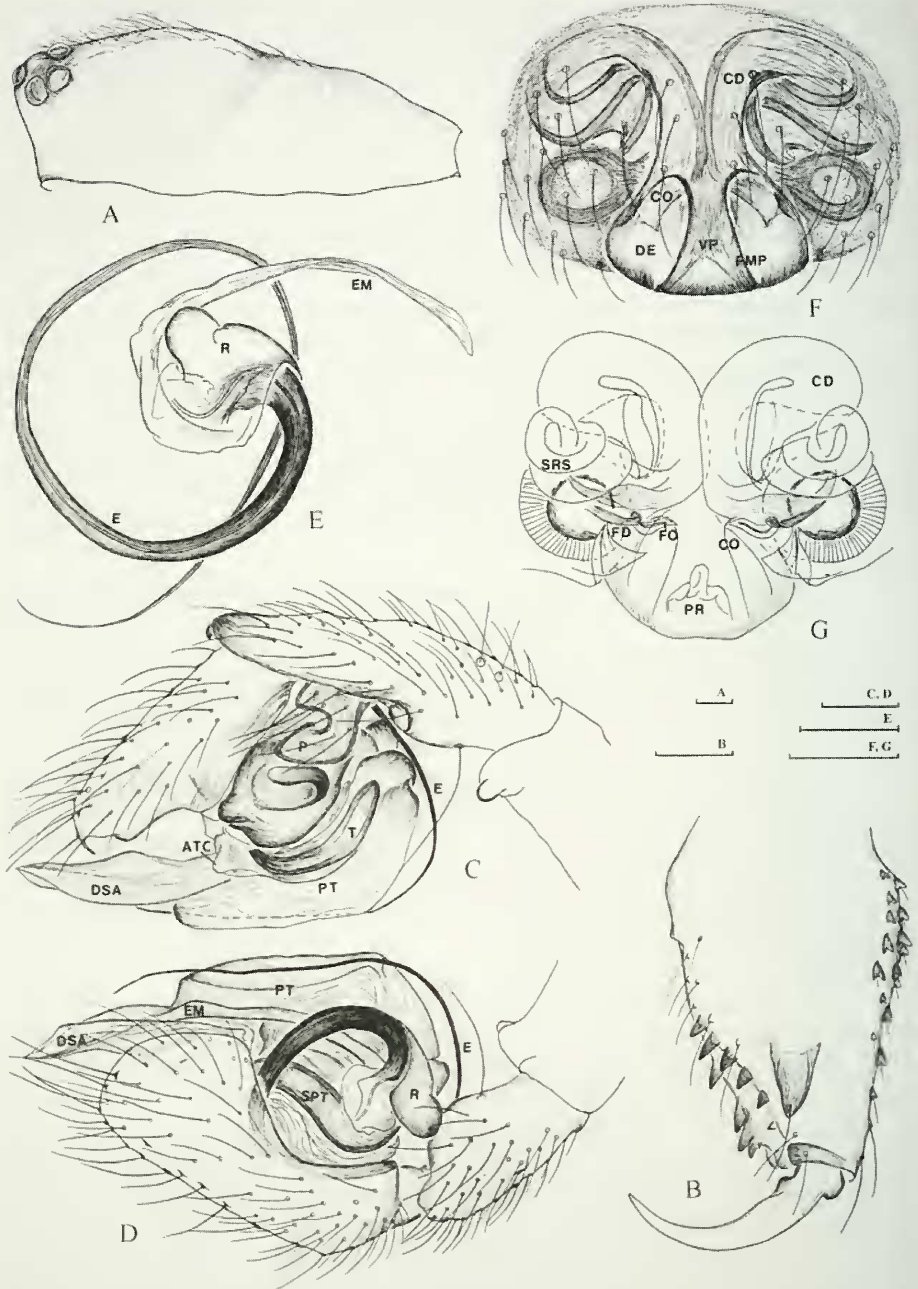


FIG. 2

*Gnathonarium cambridgei* Schenkel, 1963. A, carapace of male, lateral view; B, left chelicera of male, anterior view; C, left male palp, retrolateral view; D, left male palp, prolateral view; E, embolus division, ventral view; F, epigynum, ventral view; G, vulva, dorsal view. [Scale lines: 0.1 mm].



3. *Gnathonarium dentatum* (Wider, 1834)

Fig. 3

*Theridion dentatum* Wider, 1834: 229, pl.15, fig. 8 (♂ ♀).*Gnathonarium dentatum*: Anonymous, 1977: 37, figs 5A-F (♂ ♀); Song, 1980: 155, figs 83A-F (♂ ♀); Hu, 1984: 194, figs 203.1-4 (♂ ♀); Guo, 1985: 105, figs 2-47.1-3 (♂ ♀); Zhu & Shi, 1985: 115, figs 101A-E (♂ ♀); Song, 1987: 150, figs 111 (♂ ♀); Zhang, 1987: 127, figs 105.1-5 (♂ ♀); Feng, 1990: 134, figs 109.1-5 (♂ ♀); Chen & Gao, 1990: 108, figs 135A-B (♂ ♀); Chen & Zhang, 1991: 176, figs 174.1-6 (♂ ♀); Song, Zhu & Li, 1993: 860, figs 14A-D (♂ ♀); Zhao, 1993: 183, figs 84A-C (♂ ♀); Song, Zhu & Chen, 1999: 169, figs 96A, L (♂ ♀); Hu, 2001: 544, figs 365.1-4 (♂ ♀); Song, Zhu & Chen, 2001: 129, figs 68A-F (♂ ♀).

*Material examined.* 2♂2♀ (NMB, KATNR 296), Kloster Tschokurtan (today's name not clear), Gansu Province, leg. Dr G. N. Potanin, 07.04.1886; 2♂4♀ (MHNG), Dashitou Town, Jilin Province, leg. Y. Tao, 28.VIII.1988; 4♂3♀ (IZCAS, Tu0007), Shandan District, Gansu Province, leg. X. P. Wang, I.VIII.1988; 1♀ (IZCAS), Yangri Town to Xinhua Town, Shennongjia Forest Region, Hubei Province, leg. S.Q. Li, 18.VIII.1986; 6♂13♀ (IZCAS), Chunhua District, Jilin Province, leg. J.C. Gao, 17.VIII.1990; 8♂12♀ (IZCAS, Tu0008), Kongcun Village, Yongnian District, Hebei Province, leg. S. Q. Li, VI-XII.1994; 3♀ (IZCAS), Kongcun Village, Yongnian District, Hebei Province, leg. S. Q. Li, VI-XII. 1994; 1♂ (IZCAS), Liaoning Province, 1985; 2♂1♀ (IZCAS), Yuanmingyuan Park, Beijing City, leg. S.Q. Li, 11.V.1990; 2♂1♀ (IZCAS), Mt. Xiangshan, Beijing City, leg. S.Q. Li, 25.X.1987; 1♀ (IZCAS), Bameng, Inner Mongolia Autonomous Region, leg. S. Y. Yu, 17.V.1980; 1♂ (IZCAS), Xiaoxi Natural Reservoir, Xiushan District, Sichuan Province, 9.VI.1989; 1♂1♀ (IZCAS), Qapqal Xibe Autonomous District, Xinjiang Uygur Autonomous Region, 5.VII.1991; 1♂ (IZCAS), Liuba District, Shaanxi Province, leg. J. Chen, 20.VII.1998.

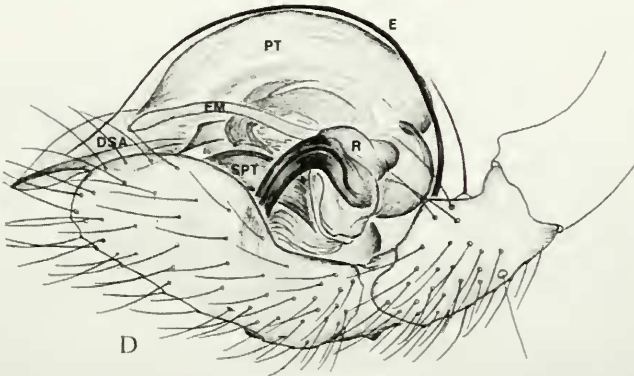
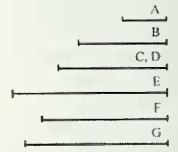
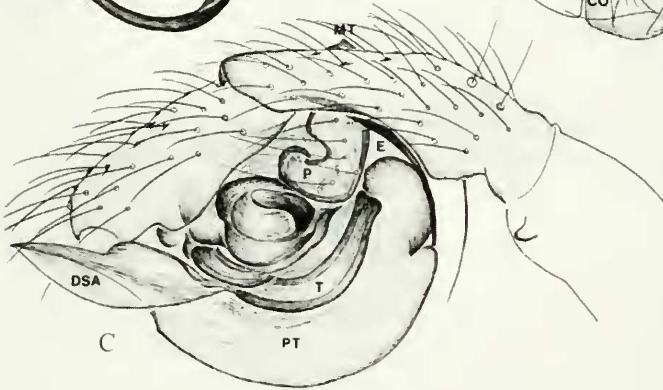
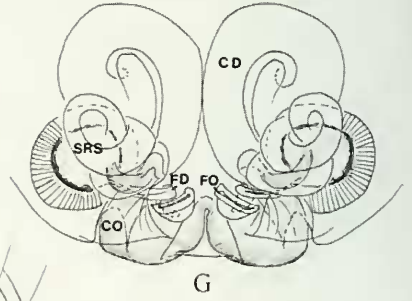
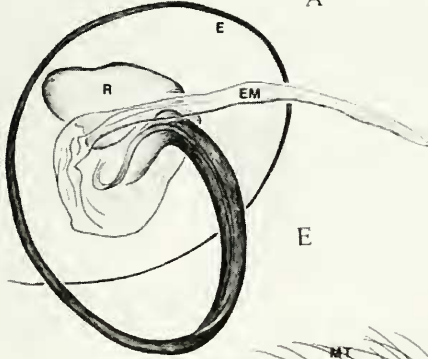
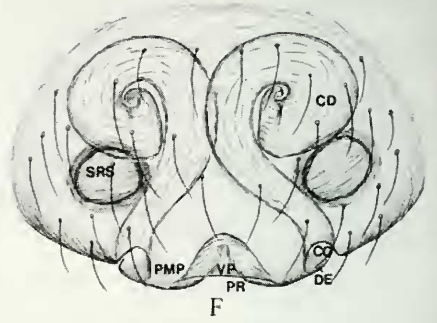
*Diagnosis.* Shape of carapace similar to that of *G. cambridgei*, but the male is easily recognized by the distal suprategular apophysis (DSA) having a large dorsal lobe with a flat-roof (Fig. 3C) and the female by having a posterior median plate with small copulatory openings (CO) and depressions (DE), as well as a large posterior recess (PR) (Fig. 3F).

*Description.* TL 1.83-2.42. Carapaces of both sexes as illustrated in Fig. 3A, without conspicuous modification, ocular area protruding slightly over clypeus, with some hairs lying behind ocular area. Chelicerae of both sexes with warty granulations anterolaterally, promargin with six teeth, retromargin with four, the first one of retromargin bifurcated; male with an additional tooth-like frontal process, with a fine hair at its tip (Fig. 3B). Tm I 0.58- 0.59. Tm IV present. Measurements and a detailed description of the somatic morphology were provided by Wider (1834).

Male palp (Figs 3C-E): Distal process of patella small. Mesal tooth of tibial apophysis (MT) triangular, smaller than in *G. biconcavum* sp. n.. Distal suprategular apophysis (DSA) dominated by a large dorsal lobe with the roof almost flat. Unlike in *G. cambridgei*, anterior part of tegulum without conspicuous anteroventral cornu.

Epigynum (Figs 2-3F): Copulatory ducts seemingly shorter than in *G. cambridgei*, about one circle with its apicle part blunt and slightly rolled. Posterior median plate with very small copulatory openings (CO) and depressions (DE), EI= 5.53, ventral plate covering most part of posterior recess (PR), posterior margin of posterior median plate deeply notched.

*Distribution.* Palearctic. In China the species was found in Beijing, Gansu, Hebei, Hubei, Inner Mongolia, Jilin, Liaoning, Shaanxi, Sichuan and Xinjiang.



4. *Gnathonarium gibberum* Oi, 1960

Fig. 4

*Gnathonarium gibberum* Oi, 1960: 149, figs 44-49; Anonymous, 1977: 37, figs 6A-E; Zhu *et al.*, 1980: 158, figs 84A-E; Wang, 1981: 109, figs 50A-C; Hu, 1984: 194, figs 204.1-4; Guo, 1985: 106, figs 2-48.1-2; Song, 1987: 152, fig 112; Zhang, 1987: 128, figs 106.1-3; Feng, 1990: 135, figs 110.1-5; Chen & Gao, 1990: 109, figs 136a-b; Chen & Zhang, 1991: 177, figs 175.1-5; Song, Zhu & Li, 1993: 860, figs 15A-E; Zhao, 1993: 185, figs 85A-D; Song, Zhu & Chen, 1999: 170, figs 96F-G, 97A; Song, Zhu & Chen, 2001: 131, figs 69A-E.

*Material examined.* 1♂ 1♀ (MHNG), Huzhou City, Zhejiang Province, 2. VI.1979; 1♀ (IZCAS), Sanmen District, Zhejiang Province, VI.1979; 2♀ (IZCAS), Sanmen District, Zhejiang Province, leg. S. X. Zheng; 1♂ (IZCAS), Guoliang Farm, Liangdu Town, Yuhang District, Zhejiang Province, 15.X.1966; 1♂ 3♀ (IZCAS), Beijing, VII.1974; 1♂ (IZCAS), Hongqi Town, Guangji District, Hubei Province, 27.VII.1976.

*Diagnosis.* The male of *G. gibberum* is easily distinguishable from all other Chinese *Gnathonarium* species by the carapace having a large, hump-like elevation behind the ocular area (Fig. 4A). The epigynum (Fig. 4C) is very similar to that of *G. dentatum*, but can be distinguished by its longer copulatory ducts (CD), with a point apex (Figs 4F, G).

*Description.* TL 2.00-3.00. Carapace of male rising into large lobe behind ocular area; a deep groove lying between lobe and ocular area, and plenty of hairs present in groove and on lobe (Fig. 4A). Carapace of female as in other species, without conspicuous modification. Chelicerae of both sexes with warty granulations anterolaterally, promargin with five teeth, retromargin with four, the first one of retromargin bifurcated; male with an additional tooth-like frontal process, with a fine hair at its tip (Fig. 4B). Tm I 0.62- 0.66. Tm IV present. Measurements and a detailed description of the somatic morphology were provided by Oi (1960).

Male palp (Figs 4C-E): Distal process of patella blunt. Morphological characters of male palp almost the same as in *G. dentatum*. See diagnosis and description of *G. dentatum* for more details. It is difficult to distinguish the two species by the male palp only.

Epigynum (Figs 4F-G): Copulatory ducts (CD) longer than those of *G. dentatum*, about one and half circle, with a point apex (Fig. 4F; cf Fig. 3F). Posterior median plate with small copulatory openings (CO) and depressions (DE), EI= 3.09, posterior margin of posterior median plate notched.

*Distribution.* China, Korea, Japan and Russia. In China the species was found in Beijing, Hubei and Zhejiang.

FIG. 3

*Gnathonarium dentatum* (Wider, 1834). A, carapace of male, lateral view; B, left chelicera of male, anterior view; C, left male palp, retrolateral view; D, left male palp, prolateral view; E, embolus division, ventral view; F, epigynum, ventral view; G, vulva, dorsal view. [Scale lines: 0.1 mm].

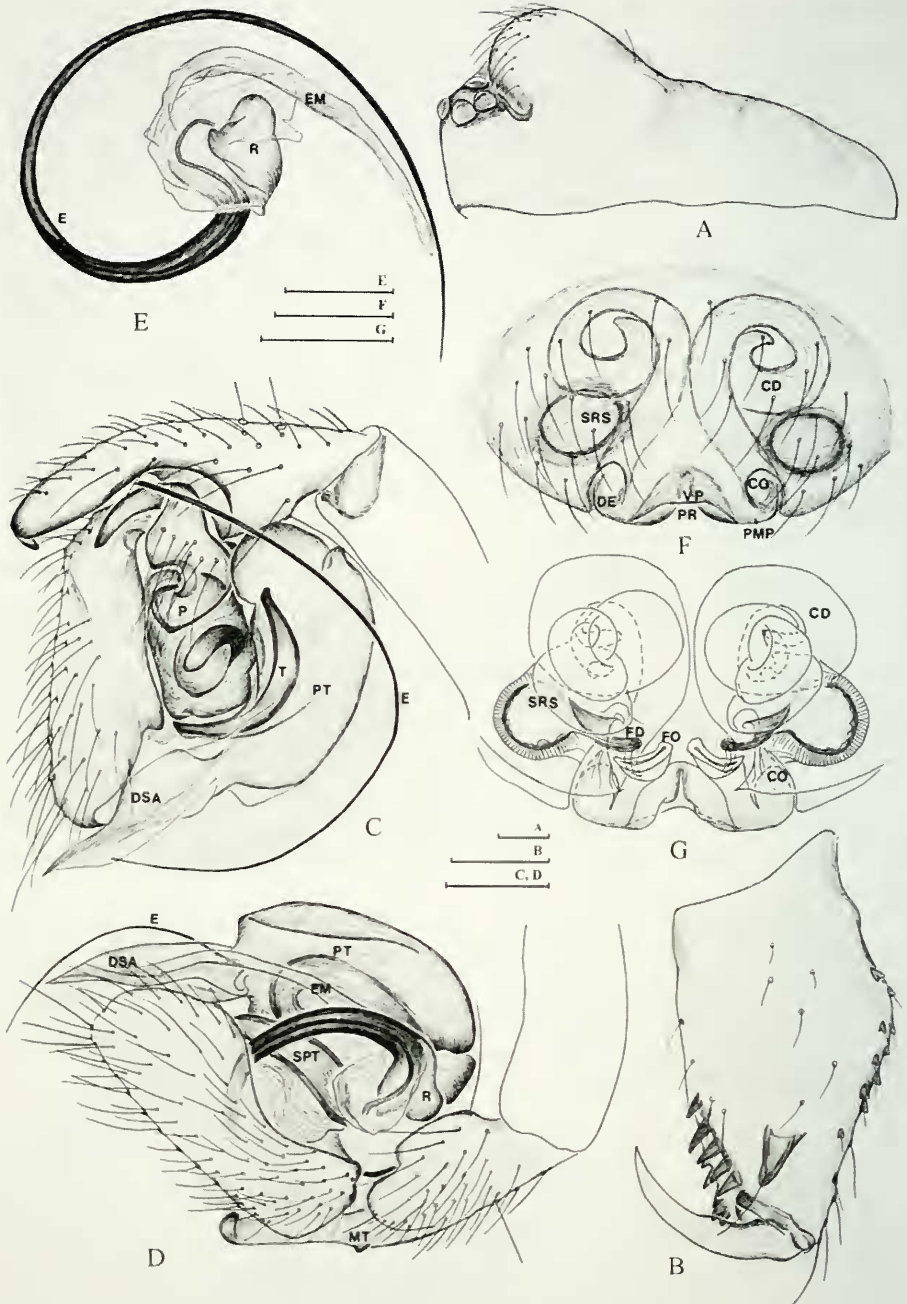


FIG. 4

*Gnathonarium gibberum* Oi, 1960. A, carapace of male, lateral view; B, left chelicera of male, anterior view; C, left male palp, retrolateral view; D, left male palp, prolateral view; E, embolus division, ventral view; F, epigynum, ventral view; G, vulva, dorsal view. [Scale lines: 0.1 mm].

## ACKNOWLEDGEMENTS

We are grateful to Dr Peter Schwendinger (MHNG), Dr Michael I. Saaristo (University of Turku, Finland) and Dr Xinping Wang (Brooks Center for Rehabilitation Studies at the University Florida and the Rehabilitation Outcomes Research Center at the Malcom Randall VA Medical center in Gainesville, Florida, USA) for their critical review of the previous version of the present paper. Special thanks are given to Dr Rod Crawford (UWBM), Dr Jiuchun Gao (JLU), Dr Ambros Haenggi (NMB) and Dr Christine Rollard (MNHNP) for the loan of the studied material.

This study was supported by the National Natural Sciences Foundation of China (NSFC-30270183, 30370263), by the National Science Fund for Fostering Talents in Basic Research (NSFC-J0030092), and partly also by the Kadoorie Farm and Botanic Garden, Hong Kong Special Administrative Region, China.

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